

# **GEO**

## **Guyana Economic Opportunities**

### **Study on the Feasibility of the Production of Clay Tiles for Floors and Roofs in the Rupununi**

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## **I. Introduction**

The following is a report on the consultant's visit to the Rupununi region in Guyana. In particular, the following indigenous settlements were visited: Toka, Annai, Shulinab, Potarrinau, Sandcreek, and Aishalton. The purpose of the visit was to analyze the ability to locally produce clay tiles for use as roofing material in the Rupununi region. This report has been translated from the original Portuguese, thus necessitating certain references to Portuguese terms.

## **II. Clay Quality**

The quality of the clay in the places visited – the indigenous settlements in the Rupununi region in the interior of Guyana – is satisfactory for the manufacture of bricks for the construction of walls.

None of the samples collected exhibited satisfactory characteristics for the manufacture of floor tiles (in Portuguese, this type of product is called "lajota"). For the manufacture of tiles for roofs (in Portuguese, this designation is not used; the term used in Brazil is simply "telha de barro" [clay tiles]), no samples were found that could be used for this purpose. This is due to the fact that the sample collection period was short and the search was not conducted in a systematic manner; available time was limited to three days.

In a region so vast, crisscrossed by rivers and streams, one would think that there would be innumerable sources of good-quality clay, but in order to find them, it would be necessary to motivate and instruct the inhabitants of the region to look along the banks of the rivers and lakes where such good-quality sources are generally found. The "tuxauas," brickmakers and many other individuals were taught how to test the clay to see whether it was of good quality. Since good material was not found, the consultant and Mr. Clairmont Lye, Director of the Beacon Foundation, agreed that the former would send the latter some material of excellent quality from which the latter could distribute small samples to the "tuxauas" for educational purposes, by allowing tuxauas to moisten and knead the clay, as well as to ascertain the manner in which the clay destined to be used for bricks should be "bound."

## **III. Empirical Method**

The method used to determine the quality of clay for the manufacture of ceramic products involves making a cylinder the diameter of a pencil with a probe of soil containing no plant roots or stones and moistened with a handful of water. Then, one makes a letter "U", or curve, with the cylinder. If the cylinder does not break, or if there are no cracks, this means that it is good material; it is high-plasticity clay that can be used in the manufacture of floor and roof tiles, as well as to make domestic utensils such as pots, pans, water storage vessels, clay jars, ashtrays, flower vases, musical instruments, and a wide variety of craft items.

#### **IV. Local Methods of Brick Manufacturing**

The local method for manufacturing bricks is the same as that used in Boa Vista, Brazil.

At the four brick works visited, the consultant found that few people work at this trade; difficulties are encountered in transporting firewood within the area, as well as in conveying the bricks to a place where a truck can be parked. These factors limit production, or at least render it more difficult.

The use of wooden forms is quite efficient, but in order to improve the process even further, standardization is required. The use of forms with two wooden rollers, as observed at Aishalton, contributes to low-production yield, and use of these forms should be avoided. The size of the forms is also important if one wishes to achieve high levels of profitability in the manufacture of bricks. Large forms produce a heavy brick, useful in building thick walls, and such a brick is recommended where mortar is not used, although there is a disadvantage in terms of the number of units produced during a working day. If the wall is to be built with mortar, such heavy bricks are unnecessary, because the mortar will guarantee the quality of the wall. Therefore, it is necessary to use a standard form for the manufacture of two-hole bricks.

Another observation with regard to the location of the brick works has to do with access. The road leading to the site should be clear from obstructions such as tree trunks and branches that hinder the movement of people and cargo. Such roads can be used when the situation allows for the use of harness animals such as oxen or mules; the use of handcarts should be avoided.

#### **V. Location of Brick Works**

With regard to the location of the work sites, the closer such sites are to workers' residences, the better day-to-day access will be, since local transportation is by foot or bicycle. For this reason, incentives should be offered to the population residing in the settlements to identify raw material sources. Additional issues to be taken into account include distances, access, periods of flooding, conditions for truck traffic and other means of transport, and the proximity of firewood to facilitate production.

#### **VI. Substitution of Roofs**

The construction method employed for construction of local residences does not permit the use of clay tiles for two basic reasons:

- 1) The degree of slope should not be greater than 30 degrees, and in most cases, that figure is 75 degrees (see roof structure in Exhibit 1).
- 2) The support pillars are of a small diameter and distances between rafters are random and generally greater than is recommended.

The following are the suggested solutions for the above problems. Support pillars should be replaced and new roofing structures built. This procedure deserves attention, and each case should be studied individually. For example, the following relates to the modification of the roof of a house measuring 3.5 meters by 5.0 meters, which is a common dimension in the region. The cost of materials for the structure of such a roof is approximately US\$346.00 (wood plus nails). This assumes that each resident will make the modifications himself, and that the wood will be purchased in Lethem, where the wood comes from lumberyards. If there is good-quality wood in the region, the pillars could be of round wood, and this would reduce the roof replacement cost.

## **VII. Production Costs**

Production costs for tiles are quite variable, especially when those doing the production are unskilled.

One can assume that a person with experience in this type of production can produce 400 tile units per day, and that a thousand units of a similar product produced on an industrial scale at Boa Vista would be sold at a price of US\$125.00.

For the production of tiles, the price of the form is about US\$20.00. The clay is gathered at no cost and the firewood for heating it is gathered in the forest, which means that, if trucks are not used and transportation of firewood is done manually or with animal traction, the cost of the combustion material is zero. The tools used – shovels, spades, sickles, and hoes – are low in cost and total approximately US\$30.00. Therefore, a person starting out in such work would need US\$50.00 to purchase tools.

Assuming that the daily wage for a manual laborer is about US\$10.00 and that, due to inexperience, he is able to produce 100 tiles a day (providing of course that he is trained and has the proper tools), the production cost of 700 units would be US\$700.00.

To cover a house measuring 3.5 x 5.0 meters, that is, having a covered area of 27 square meters, about 700 tiles have to be produced.

One can conclude, therefore, that a resident wishing to improve the roof of a home having a total area of 27 square meters would have to work for 7 days. The cost of producing the required tiles would be US\$130.00.

Thus, the total cost for the tiles and wood would be US\$476.00 (US\$130.00 plus US\$346.00), keeping in mind that, with regard to the installation of tiles and carpentry work, each individual would supply the labor for his own home.

The cost of the tiles for this type of coverage using zinc tiles is US\$230.00. The gathering of the wood in the forest for this type of roof plus the actual building of the structure require about eight days of work, equivalent to US\$80.00, and the cost of such a roof would be US\$325.00 (including US\$15.00 for nails). This also assumes that each person supplies the labor for his own home. In this case, it would not be necessary to alter the structure of the roof.

For the production of clay tiles, let us assume that someone in training produces 500 units/day and spends three days gathering firewood and heating the tiles. The four days of work would total US\$40.00. If the tile measures 0.2 x 0.2 meters, 25 units would be required to cover one square meter. The cost of materials, excluding labor, to cover a floor that measures, say, 10 square meters, would include two sacks of cement (US\$20.00 at the settlement). The washed sand and the waste tiles used cost nothing if available in the area. Thus, it is estimated that the floor in question would cost approximately US\$40.00.

The same 10-square-meter floor, if made of concrete and with only the cement and pebbles being transported from Boa Vista to the settlement, would cost an estimated US\$200.00, excluding labor and with the cost of the washed sand being zero if brought from the bank of a river or stream.

Exhibit 2 demonstrates the typical indigenous construction style.

**Exhibit 1****Exhibit 2**